Motivational effect of cholesterol measurement in general practice health checks

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SUMMARY. A randomized trial was conducted in five general practices in and around Aylesbury, Buckinghamshire to assess the motivational effect of cholesterol measurement on compliance with advice to reduce dietary fat intake and to stop smoking. The advice was given by practice nurses during health checks for cardiovascular risk factors. A total of 578 patients were recruited to the study and randomized into two groups. Both groups were given the same advice and were followed up after a median of three months, but the intervention group was also given immediate feedback on their cholesterol concentration. Follow up was completed for 88.2% of subjects, and those who were not followed up were assumed not to have changed their behaviour. The mean fall in total cholesterol at follow up was 0.11 mmol l^{-1} (95% confidence interval 0.03 to 0.18) in the intervention group who were told their cholesterol result and 0.02 mmol l^{-1} (95% CI −0.06 to 0.10) in the control group who were not. The proportion of smokers who were not smoking at follow up was 10.7% and 10.1% in the two groups, respectively. Patients in the intervention group with an initial total cholesterol level of 6.50 mmol l^{-1} or greater showed a mean fall of 6.2% in cholesterol level whereas those with an initial cholesterol level of less than 5.20 mmol l^{-1} experienced a mean increase of 3.6%, but as differences of this magnitude were also seen in the control group they probably reflect regression to the mean rather than an effect of knowledge of cholesterol level. Thus, knowledge of cholesterol level was found to have little motivational incentive or disincentive effect, but this must be seen in the light of the small overall effect of the dietary advice given.

Keywords: cholesterol screening; coronary risk factors; attitude to health; risk reduction.

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Introduction

THE value of measuring blood cholesterol levels in the general population has been the subject of much debate. Although an elevated total cholesterol level is a potentially reversible risk factor for coronary heart disease, it is not necessary to measure it in order to make recommendations for a healthy diet. Disease risk increases linearly with cholesterol concentration and most of the population would benefit from dietary advice to reduce saturated fat intake irrespective of their cholesterol concentration.[1] The public health priority is to reduce the mean cholesterol concentration in the United Kingdom population,[2] and it is possible that this aim may be prejudiced by reassuring half the population that their cholesterol concentration is lower than average. It has been shown that patients who are thus reassured may be more resistant to dietary advice.[3]

In contrast to this potential disadvantage of measuring cholesterol levels there are two potential benefits. First, it is possible to identify those at high risk of cardiovascular disease because of severe hyperlipidaemia, particularly familial hyperlipidaemia. Secondly, patients may be more motivated to attend for preventive health care if cholesterol measurement is on offer, and those who are told they have a higher than average cholesterol level may be more motivated to change their diet, and perhaps modify their smoking habit, than those given the same advice who do not know their cholesterol level.

The importance of the motivational effect of knowledge of cholesterol concentration on behaviourial change has not been formally assessed. The aim of this study was to assess the effect of knowledge of cholesterol concentration on response to individual health education about diet and smoking given by a general practice nurse in the context of a 'health check'.

Method

The study was carried out between October 1988 and August 1990 and involved five general practices in and around the market town of Aylesbury in Buckinghamshire. Initially eight general practices were recruited to the study but three failed to complete it: one withdrew because of the work involved and two were excluded because the randomization procedure had not been properly carried out. This reduction in numbers meant that the minimum difference in the mean fall in cholesterol level between the intervention and control groups likely to be detected with statistical significance rose from the planned 0.15 mmol l^{-1} to 0.18 mmol l^{-1} (significance level 0.05, power 0.90). Reported smoking cessation in the intervention group had to be threefold greater than in the control group to achieve a satistically significant result with the same power.

All five practices were offering opportunistic 'health checks' before the study began. At these risk factors for coronary heart disease were assessed and advice given. During the study patients continued to be recruited for health checks in the normal way but, on attendance at the health check, they were randomized into two groups. Randomization was achieved by defining periods of time during which a Reflotron® (Boehringer) dry chemistry analyser would be used at the health check. Both groups provided a venous sample for laboratory determination of cholesterol level but the intervention group were given immediate feedback on their cholesterol level determined by the dry chemistry analyser operated by the practice nurse. The

practice nurses were supported by the district nurse facilitator and, before the study began, they attended a study day on the measurement of cholesterol levels and the provision of dietary advice, at which they were advised that the finding of a cholesterol level of 6.50 mmol l^{-1} or greater justified giving specific lipid lowering dietary advice. The control group did not have their cholesterol concentration determined by the nurse. Both groups were asked to attend for follow up after three months; a date was agreed ahead but the reminder method was left to the discretion of the practice nurse. At the follow-up appointment they were informed of the result of the laboratory determination of cholesterol level and were asked to provide a further venous sample. Since Reflotron results were not available for the control groups the results reported here comparing the two groups are based on the laboratory analyses only. Cholesterol concentration in venous blood was measured at the biochemistry laboratory at Stoke Mandeville Hospital, which subscribes to the Wellcome and National Quality Assurance quality control schemes. Serum cotinine concentration was measured in the Imperial Cancer Research Fund health behaviour unit for those patients claiming smoking cessation at follow up.

After excluding patients who appeared to be randomized to the wrong group according to the recorded time of entry to the study 580 patients aged 25–64 years were admitted to the study. Two patients were withdrawn because their initial cholesterol concentration as determined by the laboratory was more than 10 mmol l^{-1}. They were referred to the general practitioner for further investigation and care. The health check was administered to the remaining 578 patients, 297 in the intervention group and 281 in the control group, by the practice nurse. The content of the health check has been described in detail elsewhere.[4] Smoking habit, diet, and family and personal medical history were recorded and height, weight and blood pressure measured according to a standard protocol. Personalized advice and counselling was given on diet, smoking and exercise. Patients with high blood pressure were seen by the nurse for remeasurement on two occasions and, where necessary, were referred to the general practitioner for treatment. The latter patients (11 in the intervention group, 12 in the control group) would have received additional health education and may have been informed of their cholesterol level before the formal follow-up appointment with the nurse.

The intervention and control groups were comparable in terms of age, social class and smoking habit. However, there was a significant sex difference between the groups — 46.1% of the intervention group were men versus 37.4% of the control group (chi square = 4.20, $P<0.05$). The results are therefore presented separately for men and women. This sex difference is partly explained by the randomization method initially adopted, which was based on a weekly rotation — some practices operated well woman and well man clinics on alternate weeks, thus selectively recruiting one sex to the intervention group. The strict time constraint for each randomization block was subsequently relaxed so that nurses had freedom to determine the length of each recruitment block. Although this reduced the potential for sex bias, the nurses appeared to find it difficult to remember which randomization period they were in and a number of potential subjects were lost because of failure to randomize.

The data were analysed using *SPSS-X* and confidence interval analysis. The significance of the difference in the mean cholesterol concentration was assessed by the t test, and in smoking habit (and other characteristics) by the chi square test.

Results

Attendance rates at follow up were high — 257 patients in the intervention group (86.5%) and 253 in the control group (90.0%). The scheduled time to follow up was three months and the median interval between the initial health check and the follow-up visit was 88 days for the intervention group and 91 days for the control group. However, the nurses were intructed at the end of the study period to follow up as many patients as possible who had defaulted at three months, and the longest interval between health check and follow up was 18 months in both groups.

Total serum cholesterol level and smoking habit at the initial and follow up visits are shown in Table 1. The 40 patients in the intervention group and 28 patients in the control group who were not followed up were assumed not to have changed their behaviour from the initial visit. The mean fall in total cholesterol level was small: 0.11 mmol l^{-1} (95% confidence interval (CI) 0.03 to 0.18) in the intervention group and 0.02 mmol l^{-1} (95% CI -0.06 to 0.10) in the control group. The mean initial cholesterol levels were higher in the intervention group than in the control groups and this was true for both men and women. Indeed, for women this difference was significant ($P<0.05$). The mean individual fall in total cholesterol in men was 0.16 mmol l^{-1} (95% CI 0.07 to 0.25) compared with no change in women (95% CI -0.07 to 0.07).

Table 1. Total serum cholesterol level and smoking habit at initial and follow-up visits.

	Men		Women		All	
	Intervention (*n* = 137)	Control (*n* = 105)	Intervention (*n* = 160)	Control (*n* = 176)	Intervention (*n* = 297)	Control (*n* = 281)
Total cholesterol level						
Mean (SE) at initial visit (mmol l^{-1})	5.96 (0.04)	5.86 (0.11)	5.58 (0.09)	5.35 (0.08)	5.76 (0.06)	5.54 (0.07)
Mean (SE) at follow-up visit (mmol l^{-1})	5.76 (0.09)	5.75 (0.10)	5.55 (0.08)	5.38 (0.07)	5.65 (0.06)	5.52 (0.06)
Mean change (95% CI) (mmol l^{-1})	−0.20 (−0.31 to −0.09)	−0.11 (−0.26 to 0.04)	−0.03 (−0.13 to 0.07)	+0.03 (−0.07 to 0.13)	−0.11 (−0.18 to −0.03)	−0.02 (−0.10 to 0.06)
Smoking habit						
% who were smokers at initial visit	33.6	29.5	18.1	21.6	25.3	24.6
% who were smokers at follow-up visit	29.9	25.7	16.3	19.9	22.6	22.1
% of smokers reporting cessation at follow-up visit	10.9	12.9	10.3	7.9	10.7	10.1

n = total number of patients in group. SE = standard error. CI = confidence interval.

There was no difference between the two groups in the proportion of smokers reporting smoking cessation (Table 1). Three of the 15 patients reporting cessation had high serum cotinine concentrations (one in the intervention group and two in the control group).

Table 2 shows the change in total cholesterol level according to the initial cholesterol level. In patients with an initial cholesterol level of less than 5.20 mmol 1^{-1}, the mean total cholesterol level had increased at follow up in both intervention and control groups. Conversely, in the patients with an initial cholesterol level of 6.50 mmol 1^{-1} or above, the mean total cholesterol level had fallen in both groups; the overall decrease was 6.2% in the intervention group and 6.3% in the control group. In patients with an intermediate initial cholesterol level of 5.20–6.49 mmol 1^{-1}, there was little change. As a higher proportion of the intervention group were in the upper cholesterol bands at the initial visit than the control group (24.2% had 6.50 mmol 1^{-1} or more versus 22.4%) the distribution between cholesterol bands in the intervention group was adjusted to that of the control group and the actual changes observed in each cholesterol band in the intervention group applied. The adjusted fall in cholesterol level in the intervention group was then found to be 0.08 mmol 1^{-1} (95% CI 0.01 to 0.15). The results for the intervention group were also reanalysed using the Reflotron results. Although there were some discrepancies between the two sets of initial measurements, there was no change in the overall pattern observed, with patients with the lowest cholesterol levels showing a rise at follow up and those recording the highest values showing a fall.

Discussion

The overall reduction in cholesterol level achieved in this study was small. This may reflect lack of motivation to change or the inadequacy of the dietary advice and support given to those who were motivated to change. Whatever the reason, the reduction in cholesterol level achieved was not affected by whether or not patients were told their cholesterol level at the health check.

The extent of cholesterol reduction achieved is less than that reported from the one randomized trial of the effectiveness of nurse advice on diet in general practice.[5] This trial, which was based in one general practice in Abingdon, Oxfordshire, showed an overall reduction in total cholesterol level in the intervention group of 2.7% at three months and 4.1% at one year. In a more recent general practice follow-up study in west Oxfordshire the mean overall fall in total cholesterol level was 12%,[6] but this study was restricted to patients with an initial total cholesterol level greater than 6.5 mmol 1^{-1}. The 6% reduction in control patients with initial total cholesterol levels of 6.50 mmol 1^{-1} or greater in the present study suggests that about

half of the 12% reduction found in west Oxfordshire can be attributed to regression to the mean.

Although the nurses in this study attended a study day on the measurement of cholesterol and the provision of dietary advice and were backed up by a nurse facilitator, the situation differed from that in Abingdon and west Oxfordshire. In Abingdon the initial advice was given to patients in a 30 minute session followed by three months unspecified 'support'. In west Oxfordshire, practice nurses were supported by a nurse facilitator dedicated to the cholesterol reduction project who offered help and support in the management of individual patients. In this study the intervention was limited to a single 'health check' covering more than one cardiovascular risk factor with discretionary follow up by the nurses. Although this level of intervention may offer little scope to demonstrate the motivational effect of an individual having knowledge of his or her cholesterol level, it is what is actually happening in general practice in the United Kingdom at the present time.

Apart from the issue of overall cholesterol reduction, the study was also designed to assess whether the movitation felt by patients with high cholesterol levels is balanced by the reassurance felt by those with low levels, as suggested by Kinlay and Heller.[3] At first sight this appears to be the case, but the similarity between the changes in those with low cholesterol levels in the intervention and control groups suggests that this is due either to natural variation, that is regression to the mean, or to general dietary advice rather than to specific knowledge of cholesterol level.

The proportion of smokers reporting that they had stopped at follow up is similar to that found in a previous trial of nurses providing smoking cessation advice in general practice.[7] Although the knowledge of cholesterol level appeared to have little effect in addition to the smoking cessation advice, the power of the study was limited and sustained smoking cessation (which is always considerably less than the point prevalence figures reported) was not recorded.

One aspect of the study is disappointing. As part of the study quality control procedure the randomization sequence was checked by hand in each practice. Two practices were excluded because the randomization procedure had not been followed. A number of patients in other practices were also excluded because they appeared to have been allocated incorrectly. Despite these meticulous procedures, an unexplained sex difference between the intervention and control groups remained. However, men experienced a larger fall in cholesterol level than women and the excess of men in the intervention group cannot explain the lack of motivational effect seen. Similarly, any patients who asked the nurses for an immediate cholesterol result and consequently were put into the intervention group would also be more

Table 2. Mean change in total cholesterol level between initial and follow-up visits according to initial total cholesterol concentration.

Initial cholesterol level (mmol 1^{-1})	Intervention group			Control group		
	No. of patients	Mean change in cholesterol level (mmol 1^{-1})	Mean % change[a] (95% CI)	No. of patients	Mean change in cholesterol level (mmol 1^{-1})	Mean % change[a] (95% CI)
<5.20	96	+0.14	+3.6 (1.0 to 6.2)	112	+0.25	+6.2 (3.5 to 8.9)
5.20–6.49	129	−0.10	−1.5 (−3.2 to 0.2)	106	−0.04	−0.7 (−2.9 to 1.5)
6.50–7.79	59	−0.42	−6.0 (−8.9 to −3.1)	55	−0.37	−5.2 (−7.6 to −2.8)
7.80–10.0	13	−0.65	−7.5 (−13.2 to −1.8)	8	−1.18	−14.2 (−29.2 to 0.8)
All	297	−0.11	−1.0 (−2.3 to 0.3)	281	−0.02	+0.8 (−0.8 to 2.4)

[a]Mean of the percentage change in each individual. CI = confidence interval.

motivated to change. Therefore, in view of the small motivational effect demonstrated, it is unlikely that problems of randomization have seriously affected the study outcome.

This study provided no evidence that patients who are told their cholesterol concentration are more motivated to respond to dietary advice or to stop smoking than those who are not. It can be concluded that movitation for dietary change is not a strong argument for cholesterol measurement in general practice health checks, and that a low cholesterol level is not a disincentive to maintaining a healthy diet. It remains important to carry out cholesterol measurements in order to identify patients with severe hyperlipidaemia, who have a high chance of premature death without treatment. The offer of cholesterol measurement may also be an important incentive to attendance at health checks or similar health education sessions in primary care. However, the results of this study reinforce the view expressed in the report of the 'Oxcheck' trial,[8] that effective dietary advice and support is difficult to provide in the context of general practice health checks. The identification of patients with familial hyperlipidaemia cannot be achieved without identifying a far larger number of patients with moderate hypercholesterolaemia. Cholesterol measurement will be of no benefit to these latter patients and to the National Health Service if effective dietary help is not available.

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